Foreign Animal Disease Report

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ABOUT THE FAD REPORT

The Foreign Animal Disease (FAD) Report is intended to help provide up-to-date reviews, status reports, and related information about economically significant diseases of livestock and poultry, foreign to the United States. This issue reestablishes the series, started in January 1972, that last appeared in October 1979. (Dr. E. I. Pilchard, 301-436-8087)

Current Events

FMD IN DENMARK

Foot-and-mouth disease (FMD) reappeared in Denmark during 1982, following 12 years of freedom from the disease in that country. Vaccination against FMD has been prohibited there since 1977. Foot-and-mouth disease was diagnosed on the island of Funen on March 18, 1982. Epidemiological investigations to determine the source of this outbreak are continuing. FMD virus of serotype O was isolated from affected cattle and swine. The disease was found on 21 premises in eastern and northern Funen and 1 premises on the island of Zealand during the period ending on May 4. Affected premises were quarantined, and all susceptible animals were destroyed and buried as quickly as possible following diagnosis. Premises were then cleaned and disinfected. In addition to the considerable costs of the eradication efforts, Denmark estimates a weekly loss of $2.5 million in export trade to markets in the United States and Japan.

Dr. Keith Hand and Dr. Kay Wheeler of VS were with the Danish State Veterinary Services during this outbreak to obtain firsthand experience in FMD eradication. Dr. William Buisch, Chief Staff Veterinarian, VS National Emergency Field Operations, also traveled to Denmark to observe methods that may be applied to FMD eradication plans for the United States. (Dr. K. A. Hand, 301-436-8065)

BIRD IMPORTS

Of 653,939 cage birds brought into this country last year through commercial or Federal quarantine stations, 21,383 were refused entry by Department inspectors, because they were infected with exotic Newcastle disease virus. That is about one rejected of every 30 received.

Another 2,491 birds were abandoned at the border or seized by U.S. Customs agents. Of these, 1,926 were held in quarantine for at least 45 days before being sold at auction or donated to zoos. The rest died during quarantine from stress and other disease conditions, including exotic Newcastle disease.

Although exotic Newcastle disease affects all birds, it is most damaging to poultry and can kill all the birds in a fully susceptible, unvaccinated flock. The disease will kill many types of pet birds, but others can become infected and spread the virus without showing any signs of the disease, thereby posing a constant threat to poultry and other birds. (Dr. S. S. Richeson, 301-436-8170)

HAITIAN ASF PROGRAM BEGINS

As a part of an international cooperative program to eradicate African swine fever (ASF) from their country, Haitians are now eliminating swine. Since there is no vaccine or cure for ASF, the only way to eradicate the disease is to eliminate the swine and bring in disease-free stock later. ASF was first diagnosed in Haiti in December 1978, and the USDA proclaimed a state of emergency April 29, 1982, to facilitate the eradication and subsequent redevelopment of the swine industry there. Mexico, Canada, and the United States are providing funds, personnel, equipment, and technical assistance for the eradication program, which is administered by the Inter-American Institute for Cooperation on Agriculture (IICA) in association with the Haitian Ministry of Agriculture.

Many swine owners have already voluntarily slaughtered their swine. Remaining swine are purchased by the eradication brigades at the time of slaughter, and the meat is returned to the owner for local consumption. The African swine fever virus presents no hazard to people, and they may safely eat the meat of infected swine.

Program officials estimate that slaughter throughout the country will be completed early in 1983. After a period of surveillance to assure no virus remains, restocking rural areas with productive breeds of healthy swine can begin.

DOMINICAN REPUBLIC REBUILDS

The Dominican Republic, which shares the island of Hispaniola with Haiti, recently completed a successful ASF eradication program and is now rebuilding its swine population. Ridding Haiti of the disease will help assure that the Dominican Republic stays free of it. (APHIS News Center, 202-447-6315)

NO WILD SWINE IN HAITI

Wildlife studies recently completed by members of the Southeastern Cooperative Wildlife Disease Study, under the direction of Dr. Frank Hayes, University of Georgia, confirmed there are no wild swine in Haiti to serve as a reservoir for the ASF virus. (Dr. Frank Hayes, Athens, Georgia, 404-542-1741)

SOFT TICKS FOUND ON HISPANIOLA

Soft ticks of the genus Ornithodoros were recently found in the Dominican Republic and Haiti. Although soft ticks have been shown capable of serving as reservoirs for the ASF virus in Africa, their potential to serve as a source of new outbreaks of the disease on the island of Hispaniola remains unknown. (Dr. D. D. Wilson, 301-436-8087)

CONTAGIOUS EQUINE METRITIS (CEM)

Contagious equine metritis (CEM) appeared for the first time in the United States during 1978, arriving with two Thoroughbred stallions imported from France to two premises in central Kentucky. Mares bred to these stallions developed the disease. CEM was brought under control through State and Federal quarantines, therapeutic treatment, and management. Less than a dozen mares remain under quarantine in Kentucky. CEM occurred again during 1979 in central Missouri in a stallion and 10 mares of the Trakehner breed. The disease was eradicated in Missouri.

In 1982, a streptomycin-resistant strain of the CEM bacterium was isolated from three Thoroughbred mares, following breeding by the stallion "J. O. Tobin" in central Kentucky. Since this disclosure, no additional cases have been found by complement-fixation testing of 6,000 serum samples and 1,000 cultural examinations of mares. No clinical signs were seen in these mares except shortened estrual cycles. (Dr. Ralph Knowles, 301-436-8433)

EMERGENCY INFORMATION

Rapid access to the literature covering foreign diseases of livestock and poultry is maintained by the Emergency Programs Information Center in its computer and microfilm-based data bank. Established at Hyattsville, Md., in 1973, the data bank holdings now include 44,000 articles on microfilm in the English language, covering over 25 foreign diseases. Of this total, 5,000 articles are translations.

Bibliographic citations of the articles are held in computer-readable files. The system utilizes a computer-readable file of index terms or keywords that refer to the articles on microfilm. These controlled vocabulary terms are maintained in a thesaurus. Users find articles on a particular topic by first searching the computer file, then locating them on microfilm with reader-printer equipment which can produce full size hard copy. Data bank services are intended for personnel working or cooperating in USDA animal disease control and eradication programs. Requests from outside APHIS are handled on an individual basis. (Dr. E. I. Pilchard, 301-436-8087)

WORLD SITUATION

Looking at reports received and evaluated during the last 12 months, **foot-and-mouth disease** (FMD) appears to be the most widespread of the diseases exotic to the United States, occurring in Great Britain in 1981 and in Denmark this spring. There were also unexpected outbreaks of Rift Valley fever in Egypt and African swine fever in the Western Hemisphere in recent years.

Foot-and-mouth disease is more or less endemic in Africa, Asia, and South America, leaving free only the North American Continent, Australia, and New Zealand. Europe is a case of "now you see it, now you don't."

According to a report from the Pirbright World Reference Laboratory for FMD in England regarding 1981 submissions for typing, type O appeared to be most prevalent, followed by $Asia_1$, SAT_1, A, SAT_2, C, and SAT_3. While all SAT

types are fairly well restricted to the southern half of Africa--and $Asia_1$ was only reported from Asia--types O, A, and C are well distributed over all these affected areas.

Efforts to control the disease, while fragmented, are probably most advanced in Europe. However, there were some serious setbacks. An outbreak in France in early 1981 spilled over to the British Isle of Wight, temporarily putting Great Britain back into the category of countries considered affected. There was no spread of FMD to the mainland, and Great Britain gained free status again less than a year after that outbreak. An outbreak in Denmark this spring caused that country to lose its FMD-free status. Although the Danes suggest this outbreak was due to windborne spread from East Germany, other possible sources are being considered. A small outbreak of FMD last year in Austria was blamed on the illegal importation of buffalo meat from India. Italy, Spain, and Portugal had outbreaks of undetermined origin. Europeans keep a very close eye on Turkey, where the disease is endemic. Outbreaks in Greece may have originated in Turkey.

While there is no space here to list all outbreaks of FMD in the rest of the world, some highlights should be mentioned: Australian slaughter cattle, which must be considered highly susceptible, became infected after arrival in Malaysia. Their clinical symptoms were so mild that the disease was only detected upon post mortem inspection. The lesson to be learned here is that the disease may be difficult to recognize even in highly susceptible animals like our domestic cattle population. Chile is the first country in South America to claim freedom from FMD, a veritable feat. Botswana, South Africa, made a strenuous and successful effort to eradicate the disease, motivated by the necessity to regain entry into the European market for its substantial beef exports.

The importance of FMD in Africa may be overshadowed by other diseases of greater economic importance to the cattle industry of that continent. **Rinderpest**, a real killer, is one of these. Following a successful vaccination campaign that almost eliminated the problem in all endemic areas, the momentum that was gained could not be maintained, and complacency set in. Consequently, the disease reappeared in areas of West Africa. New efforts are underway to regain lost ground. Rinderpest is also reported in India and occasionally in OPEC countries that depend on beef imports from affected countries.

Vaccination campaigns for rinderpest are often combined with efforts to vaccinate for **contagious bovine pleuropneumonia** (CBPP), another condition that has resisted eradication efforts in Africa--mostly in French-speaking areas and Kenya. Interestingly, CBPP appears to maintain a small "underground" focus in southern France where it was recently reported in two different locations.

Two other diseases have been active recently, but have received little publicity. They are **African horsesickness** (AHS) and **Rift Valley fever** (RVF). After a devastating spread down the Nile Valley into Egypt several years ago, no new

outbreaks of RVF have been reported. Similarly, AHS has spread widely in Africa and the Middle East in the past, but is reported only sporadically in the southern part of Africa.

Both of these vector-borne diseases could spread again at any time. Indeed, there is evidence that RVF virus remains in Egypt. Surveillance there has demonstrated serological conversion in dogs, but no clinical cases in horses.

The swine disease situation was also fairly stable during the past year. After a dramatic invasion of the Western Hemisphere, **African swine fever** (ASF) is now considered eradicated in Cuba and the Dominican Republic. An international effort, sponsored by the Inter-American Institute for Cooperation on Agriculture (IICA), and supported with substantial U.S. funds and personnel, has started in Haiti, with the expectation of ridding that country of the disease. News of ASF from Brazil is scanty, with no new cases reported. However, the disease cannot be considered eradicated there. In Europe, ASF continues to occur in Portugal, Spain, and Sardinia. It is occasionally reported in its old endemic areas in Africa.

There has been an increase of **hog cholera** in Western Europe. Increased efforts are being initiated to eradicate it from countries within the European Economic Community (EEC). Hog cholera is reported occasionally from almost all countries where there is a swine industry, except where eradication efforts have been successful.

Most reports on **swine vesicular disease** (SVD) are from Great Britain, where efforts to eradicate the disease have been going on for the past 8 years. The disease is treated more casually in other countries, notably Italy, where SVD is occasionally reported, but where there are no eradication efforts. There was a single case of SVD in Germany during 1981.

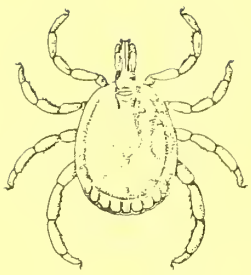
APHIS is concerned with over 40 diseases considered exotic to the United States, even though they are not regularly reported from the countries where they are presumed to exist. Most of those infected countries are in Africa. However, some exceptions are worth mentioning. For example, **dourine** persists in parts of Italy; and **heartwater** was diagnosed for the first time in the Western Hemisphere, in Guadeloupe. Other diseases of concern have not been reported in Africa. One is **contagious equine metritis** (CEM), now considered to be in England, France, Ireland, Belgium, Denmark, Austria, Italy, Japan, Australia, Federal Republic of Germany, and the United States. **Venezuelan equine encephalomyelitis** (VEE) has not made the headlines lately, but experts familiar with the disease and its cyclical nature warn that another flareup of the disease may be imminent. (Dr. H. J. Seyffert, 301-436-8285)

ERADICATED DISEASES

The United States is free of the following 12 economically significant diseases and parasites (officially declared eradicated during the indicated years): contagious bovine

pleuropneumonia--1892; foot-and-mouth disease--1929; fowl plague--1929; glanders--1934; dourine--1942; cattle fever ticks--1943; vesicular exanthema--1959; screwworms (Southeast)--1959; screwworms (Southwest)--1966; Venezuelan equine encephalomyelitis--1971; sheep scabies--1973; exotic Newcastle disease--1974; and hog cholera--1978. Exotic Newcastle disease crossed our borders each year since 1974, except in 1976, in smuggled pet birds but was quickly eliminated and has not reentered the poultry population of the United States since the 1971-73 outbreak in southern California. (Dr. E. I. Pilchard, 301-436-8087)

Focus on... Heartwater Disease



Heartwater, a serious rickettsial disease of ruminants, was once thought to be found only on the African Continent. However, it has recently been demonstrated by Perreau and his associates to be on the Caribbean island of Guadeloupe (P. Perreau, Alfort, France, 1980). This represents the first diagnosis of heartwater in the Western Hemisphere. The extent of infection in the Caribbean remains to be established.

Heartwater, in its acute form, is a septicemic infectious disease caused by ~~the rickettsia~~ Cowdria ruminantium and transmitted by ticks of the genus Amblyomma. The disease is frequently subclinical or mild in established endemic areas but is characterized by pyrexia and nervous symptoms, with high mortality rates outside of this setting. The disease takes its name from a common post-mortem finding of fluid in the pericardial sac.

HISTORY

Cowdria ruminantium was first described in 1925 by Edmund V. Cowdry, from whom the organism derives its name. This rickettsia is an intracytoplasmic, pleomorphic organism that occurs in lymph nodes singularly or in colonies. It has a predilection for vascular, endothelial cells.

The disease was first described in sheep in South Africa in 1830. In 1858 it was mentioned as a specific disease entity. In 1898 it was shown to be transmissible, and in 1900 it was reported to be disseminated by the bont tick, Amblyomma hebraeum. It is a disease that is greatly underdiagnosed today yet is probably one of the most important causes of deaths of domestic ruminants in Africa, especially in imported breeds. Heartwater is a major roadblock to affected countries that want to embark on schemes of livestock improvement.

GEOGRAPHIC DISTRIBUTION

Heartwater can be found in most African countries south of the Sahara, where Amblyomma ticks occur. The disease is also found in Madagascar and the off-lying islands of Reunion and Mauritius. The first report of the disease in the Western Hemisphere has been confirmed in the French West Indies in Guadeloupe. The presence of heartwater in the Caribbean can probably be attributed to the importation of tick-infested cattle from Africa many years ago, harboring the infectious agent. Amblyomma variegatum, one of the vectors, is found in Puerto Rico and probably throughout the Caribbean area.

SUSCEPTIBLE SPECIES

Cattle, sheep, goats, and Asian buffalo are the domestic ruminants susceptible to Cowdria ruminantium. Some types of African antelopes are also susceptible and in the absence of domestic ruminants can maintain the disease in nature. The blesbok and black wildebeest may be found as asymptomatic carriers. Natural infections with clinical syndromes have been reported in the blacksbuck, springbok, and eland. The European fallow deer has been experimentally infected. Most animals other than ruminants are refractory to infection with this rickettsia. However, laboratory mice and ferrets have supported infections for short periods of time.

CLINICAL SIGNS

The course of the disease varies from subclinical to peracute and encompasses a wide spectrum of signs. The peracute form often has no premonitory signs, and the host unexpectedly collapses and dies. When exotic breeds of livestock are introduced into a heartwater-endemic setting, this is not an uncommon occurrence. The acute form of heartwater probably is the most common in susceptible hosts. Acute heartwater is characterized by fever, with central nervous system (CNS) and pulmonary symptoms. The fever may be quite high (40-41.6°C) and often diphasic. Prominent nervous signs may include a high-stepping, stiff gait, circling, chewing movements, twitching of the eyelids, protrusion of the tongue, tremors of individual muscles and hyperesthesia. Occasionally, nervous signs can extend to aggression and rage, with unprovoked charging attacks suggestive of rabies. Convulsions with galloping movements, nystagmus, opisthotonos, and muscle tremors portend a fatal episode. The nervous signs are more commonly associated with the disease in cattle. A profuse fetid diarrhea, sometimes hemorrhagic, may also be noted. A moist cough and bronchial rales indicate pulmonary involvement. Pregnant animals may abort during any stage of gestation. The incubation period varies from 1-3 weeks.

Overt signs of sickness are infrequent in an endemic setting of heartwater disease. The subclinical form of heartwater is common in indigenous breeds where the organism and tick vector are prevalent. Although these animals will have a transient fever, other signs are seldom noticed.

PATHOLOGY

There are no pathognomonic lesions of heartwater; however, the finding of certain post-mortem changes may justify a tentative diagnosis if characteristic clinical signs were observed. Variability of lesions is due to strain differences of the rickettsia and susceptibility of the host. Peracute infection results in marked edema of the lungs, producing froth in the trachea and bronchi. Although not a consistent finding, hydropericardium, hydrothorax, and ascites are frequently associated with the acute disease. Pulmonary edema and swollen lymph nodes are commonly observed. Petechial and ecchymotic hemorrhages may be found in the heart, lungs, and gastrointestinal tract. Other observations that may be associated with acute heartwater include: hyperemia and petechiae of the abomasal mucous membranes, enteritis with occasional hemorrhages in the large intestine, and an engorged liver with a distended gall bladder. Splenomegaly and congestion of meningeal vessels may be noted, at times, in the acute form of the disease.

PATHOGENESIS

Recent work has demonstrated that Cowdria ruminantium are initially found to exist intracellularly and extracellularly in lymph nodes after phagocytosis. The organism is found in the nodes prior to its appearance in brain endothelial cells. The rickettsiae probably undergo replication in the reticular cells of lymph nodes, are then released into the lymph system, and eventually enter the peripheral circulation. From the blood stream, the organism enters vascular endothelial cells and continues to multiply by binary fission like many other tickborne rickettsiae. Cowdria possess a high degree of target cell specificity.

The invasion of Cowdria damages the endothelium of blood vessels to the extent that there are permeability changes which often result in the transudation of large amounts of fluid in the pericardial, pleural, and peritoneal cavities. The invasion of brain endothelial cells results in the central nervous system (CNS) signs.

DIAGNOSIS

There are no satisfactory methods to diagnose heartwater in a living animal. A provisional diagnosis is usually made on clinical signs and an assessment of herd history. Cowdria ruminantium may be demonstrated in brain smears prepared by crushing a small piece of tissue between two slides, fixing with methanol, and staining with Giemsa. Colonies of rickettsia appear reddish-purple to blue in the cytoplasm and range from 0.2 microns as coccoid forms to 0.8-1.7 microns in diameter in larger forms. The organisms may be found in endothelial cells of capillaries in the cerebellum, cerebrum, choroid plexus, hippocampus, and glomeruli of the kidney.
To help confirm a diagnosis of heartwater, blood from a suspicious case may be immediately subinoculated into a susceptible host; the recipient animal usually will respond with clinical signs in 6-16 days. This method is, of course, not applicable as a field test.

Heartwater will continue to go undiagnosed in many instances, until a serological test becomes available. It is difficult to prepare an antigen for this purpose, because the organism will not propagate in tissue cultures. Moreover, earlier work suggests that measurable antibodies to heartwater could only be detected for 1-4 weeks after clinical recovery. A cell-mediated immune response assay may be a possible alternative.

DIFFERENTIAL DIAGNOSIS

Heartwater, in its various manifestations and forms, must be differentiated from tetanus, piroplasmosis, cerebral babesiosis, rabies, peracute Nagana, heavy helminth infestation, anthrax, coccidiosis, hypomagnesaemic tetany, plant poisoning, strychnine poisoning, lead poisoning, and organophosphate poisoning.

VECTORS

Heartwater is transmitted by various species of the genus Amblyomma. Currently, A. variegatum, A. hebraeum, A. pomposum, A. lepidum, A. gemma, A. tholloni, and A. sparsum are proven vectors of heartwater. One of the serious threats posed by heartwater results from the continuously changing distribution of the vectors.

Amblyomma ticks are three-host ticks and have the ability to spread quite rapidly, because the immature stages of the tick are indiscriminant feeders and parasitize birds, small mammals, and even reptiles. Transstadial transmission of Cowdria ruminantium by Amblyomma ticks is a consistent finding; transovarial transmission has just been reported, but it is probably a rare occurrence in nature. It has also been demonstrated that a single infected tick can successfully transmit heartwater. The disease can be maintained in wild ungulates not in association with domestic livestock. The rickettsiae infect the endothelium and lumen of the gut in the tick; amplification of the agent may occur within the tick but is not necessary for transmission. The agent has remained viable in a fasting tick for more than 15 months.

The Gulf Coast tick, Amblyomma maculatum, has recently been shown to be an efficient, experimental vector of the heartwater agent. This significant finding emphasizes the potential danger of the disease gaining access to the American mainland and maintaining itself in the United States, where this vector is common.

EPIZOOTIOLOGY

Arthropod-borne diseases, such as heartwater, are restricted to certain geographic regions that coincide with their vectors and are referred to as diseases of place. Where heartwater and Amblyomma ticks are well established, there is a high level of immunity in domestic animals, and clinical cases with mortality rates are quite low. This ecological situation is called enzootic stability. When this host-vector relationship is out of balance, epizootics may result. Wild African ruminants that are susceptible to heartwater no doubt play a role as reservoirs for the infection; however, such reservoirs are not essential for maintaining the disease.

Certain breeds of cattle (Zebu) and sheep native to Africa appear to resist heartwater disease due to genetic selection. There are also differences in virulence of heartwater, which are probably due to strain variability. Very young animals have a short period of time in which they are innately resistant to the clinical effects of heartwater; this resistance is independent of the immune status of the dam.

After infection and recovery the agent has been found to persist in the peripheral blood for up to 60 days. This is a characteristic form of premunition immunity and is critical to the propagation and maintenance of the agent and its transmission by tick vectors. The host then undergoes a period of sterile immunity (6 mos.- 5 yrs.) only to be reinfected and produce another temporary state of infectivity; however, a permanent carrier state does not exist.

The seasonal incidence of heartwater peaks during midsummer, which is a reflection of the peak activity of the female Amblyomma ticks. In nature the disease is transmitted principally by female ticks. The transmission process usually occurs within 24 hours after the attachment of the vector.

The fact that infection rates in tick populations in the field are apparently quite low and that immature stages feed on mainly nonsusceptible hosts account for the long interepizootic intervals that can be seen in heartwater. Since the immature ticks may feed on birds, they can be carried over long distances and infect new hosts out of the endemic locations.

PREVENTION AND CONTROL

Transmission of heartwater may be interrupted by control of the vector. Acaricidal treatment can reduce the disease incidence to low levels, but eradication in a large area by dipping cattle is not feasible. The future of vector control has been further clouded by the emergence of Amblyomma strains that have developed resistance to the common acaricides (G. Uilenberg, Utrecht, The Netherlands, 1981).

There is no heartwater vaccine available, and the only method of immunization is infection and treatment. Infective blood is inoculated intravenously and followed by chemotherapeutic treatment at the time the animal begins a febrile reaction. Tetracycline is the drug of choice and is given until the fever has subsided. This is not a satisfactory method for large-scale use, and it is not without risk. The technique is often limited to highly susceptible purebred calves and cattle.

RESEARCH

To properly address the threat of heartwater and develop plans to deal with it, there is a critical need to: (1) determine its incidence; (2) acquire knowledge of vector population dynamics; (3) develop a reliable serological test; (4) establish a method to cultivate the etiological agent in vitro; and (5) develop an effective vaccine. (Dr. L. J. King, (301-436-8087)

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